



**2015 AHA Guidelines for CPR & ECC**

# **ALGORITHMS**

An Effort By:

**Pakistan Islamic Medical  
Association (PIMA)**

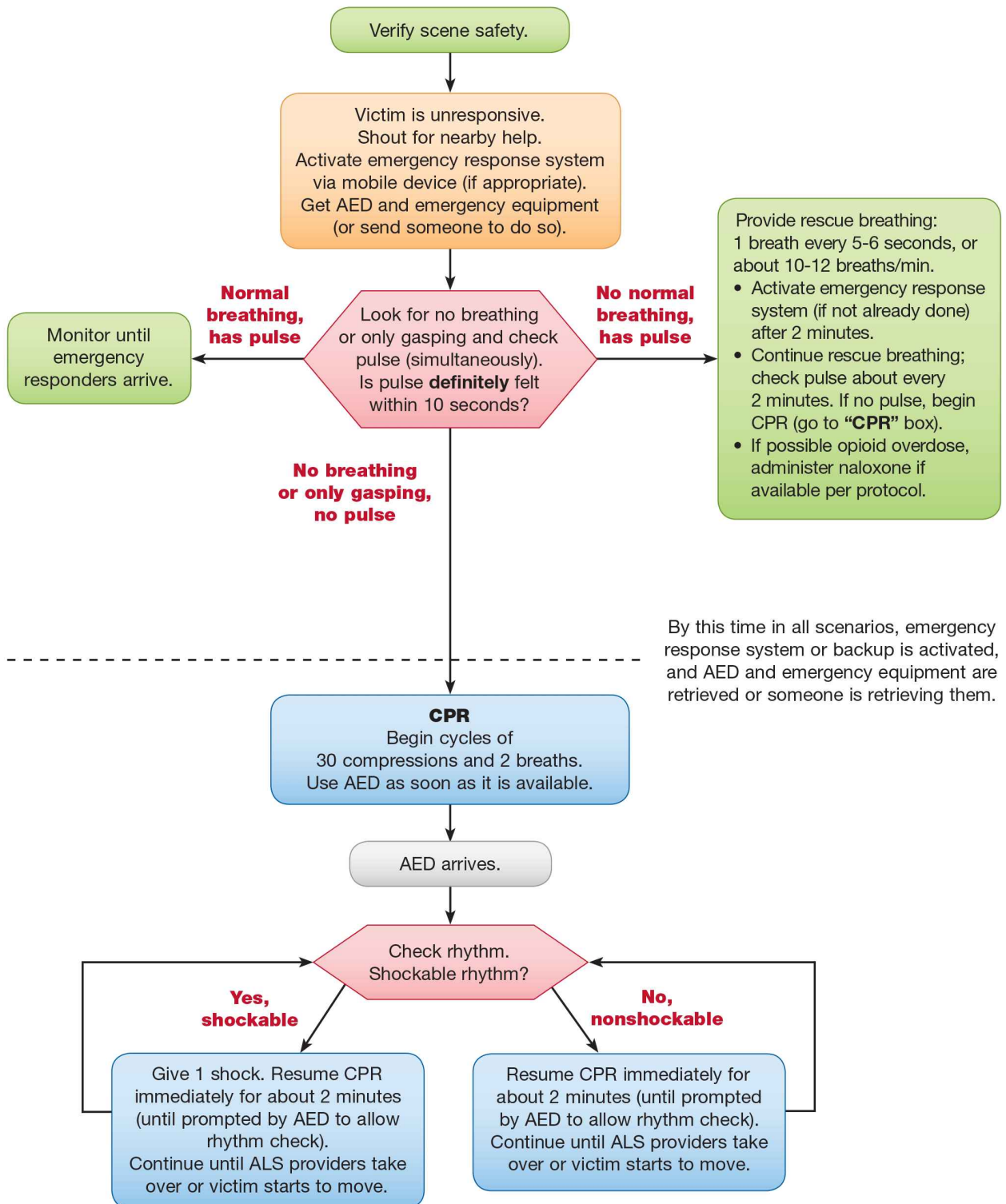
<http://pima.org.pk>

View and Download Complete Guidelines from here:

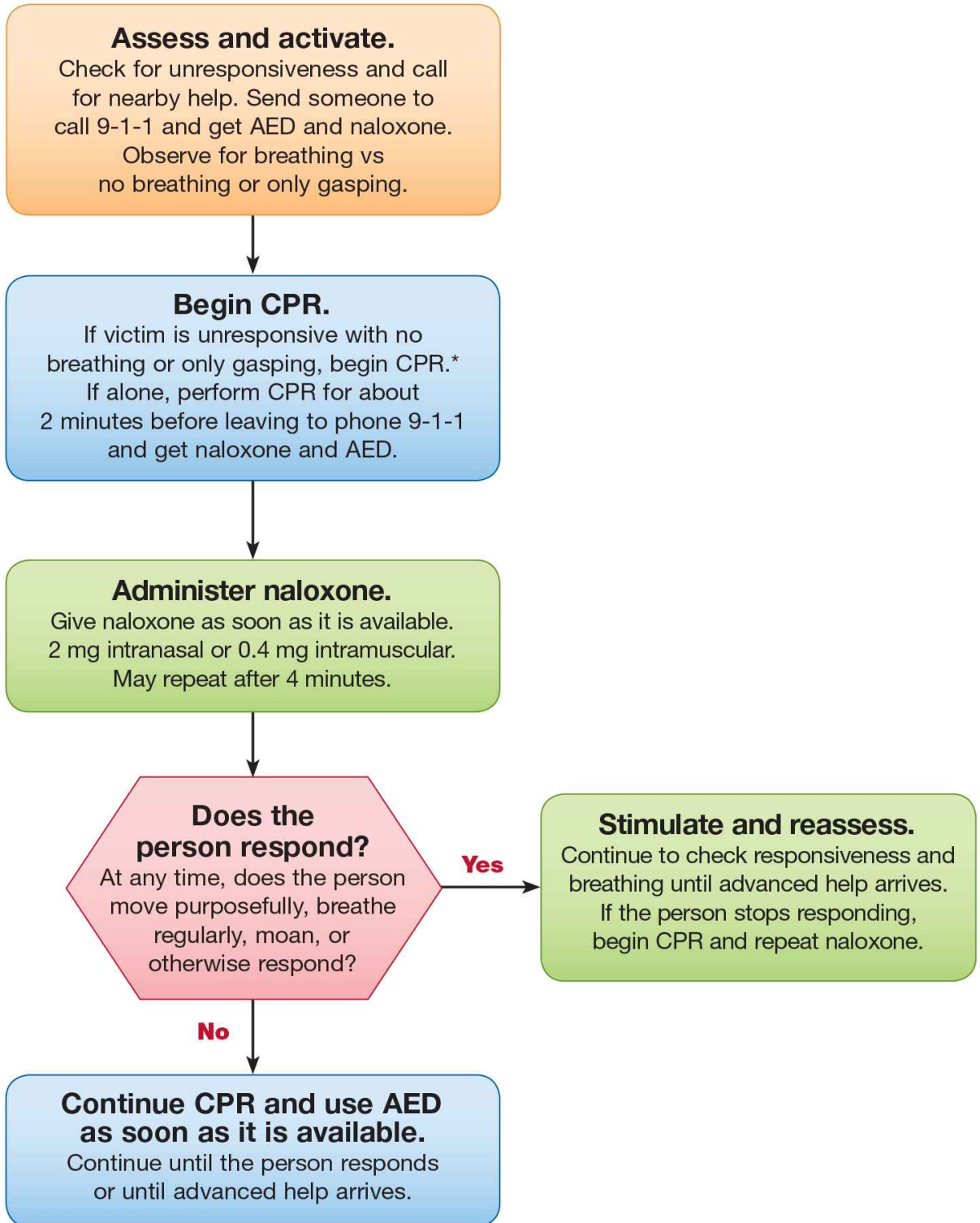
<https://eccguidelines.heart.org>

# BLS Healthcare Provider

## Adult Cardiac Arrest Algorithm—2015 Update

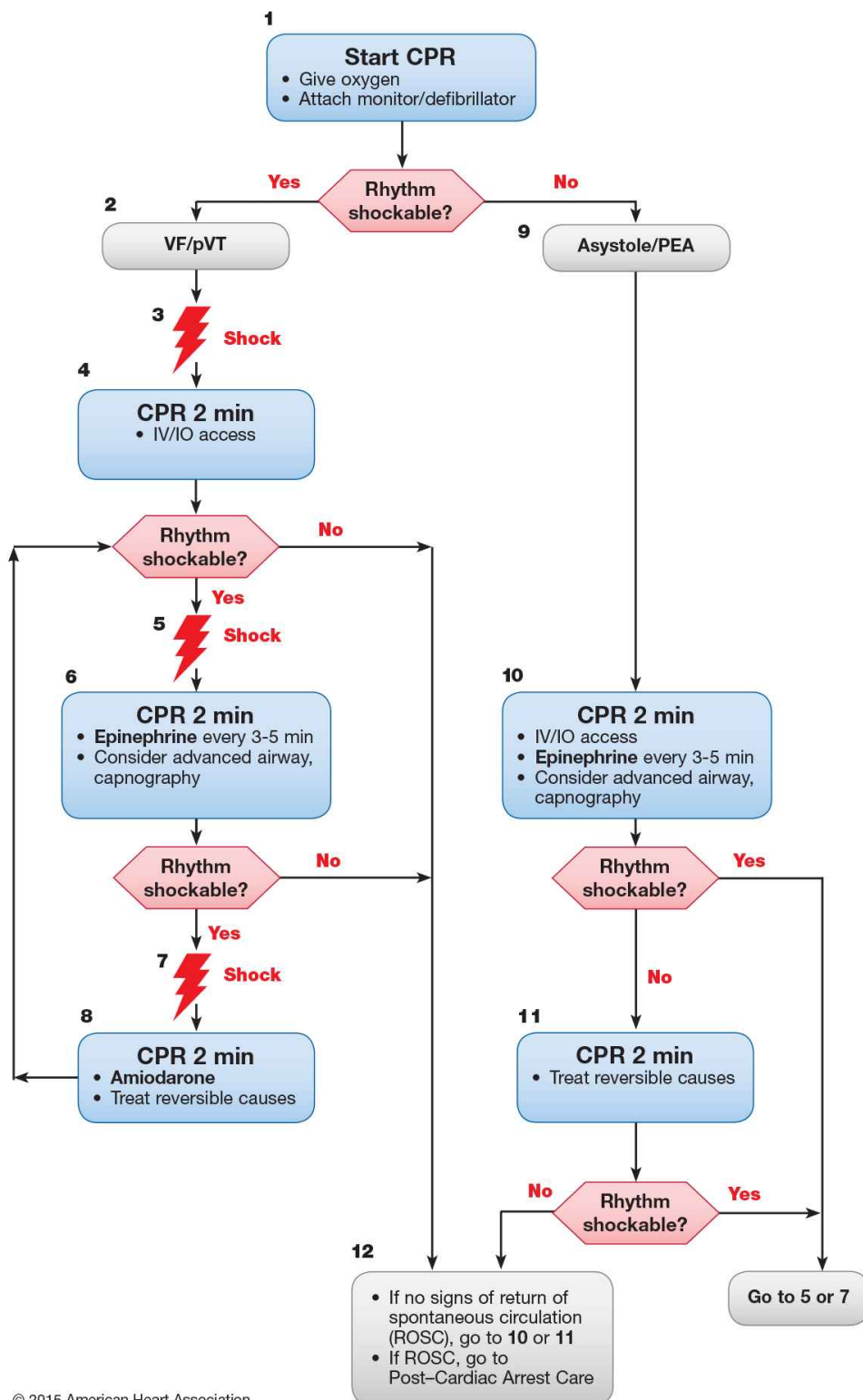


# Opioid-Associated Life-Threatening Emergency (Adult) Algorithm—New 2015



\*CPR technique based on rescuer's level of training.

# Adult Cardiac Arrest Algorithm—2015 Update



## CPR Quality

- Push hard (at least 2 inches [5 cm]) and fast (100-120/min) and allow complete chest recoil.
- Minimize interruptions in compressions.
- Avoid excessive ventilation.
- Rotate compressor every 2 minutes, or sooner if fatigued.
- If no advanced airway, 30:2 compression-ventilation ratio.
- Quantitative waveform capnography
  - If PETCO<sub>2</sub> <10 mm Hg, attempt to improve CPR quality.
- Intra-arterial pressure
  - If relaxation phase (diastolic) pressure <20 mm Hg, attempt to improve CPR quality.

## Shock Energy for Defibrillation

- **Biphasic:** Manufacturer recommendation (eg, initial dose of 120-200 J); if unknown, use maximum available. Second and subsequent doses should be equivalent, and higher doses may be considered.
- **Monophasic:** 360 J

## Drug Therapy

- **Epinephrine IV/IO dose:** 1 mg every 3-5 minutes
- **Amiodarone IV/IO dose:** First dose: 300 mg bolus. Second dose: 150 mg.

## Advanced Airway

- Endotracheal intubation or supraglottic advanced airway
- Waveform capnography or capnometry to confirm and monitor ET tube placement
- Once advanced airway in place, give 1 breath every 6 seconds (10 breaths/min) with continuous chest compressions

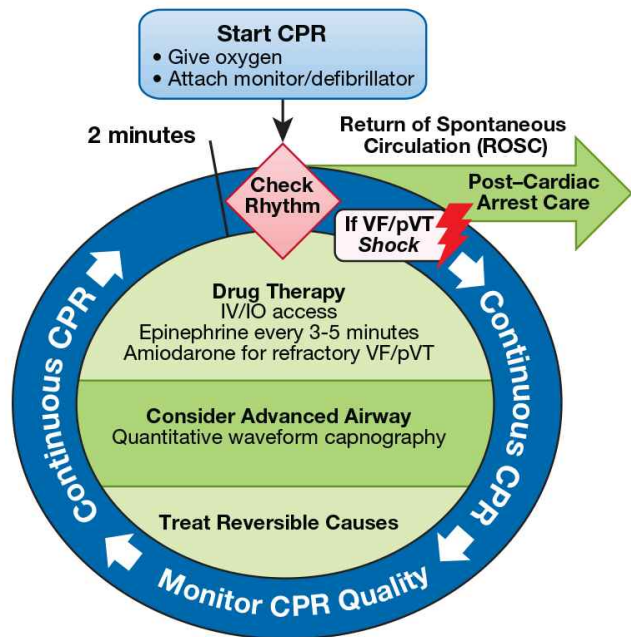
## Return of Spontaneous Circulation (ROSC)

- Pulse and blood pressure
- Abrupt sustained increase in PETCO<sub>2</sub> (typically ≥40 mm Hg)
- Spontaneous arterial pressure waves with intra-arterial monitoring

## Reversible Causes

- Hypovolemia
- Hypoxia
- Hydrogen ion (acidosis)
- Hypo-/hyperkalemia
- Hypothermia
- Tension pneumothorax
- Tamponade, cardiac
- Toxins
- Thrombosis, pulmonary
- Thrombosis, coronary

# Adult Cardiac Arrest Circular Algorithm—2015 Update



## CPR Quality

- Push hard (at least 2 inches [5 cm]) and fast (100-120/min) and allow complete chest recoil.
- Minimize interruptions in compressions.
- Avoid excessive ventilation.
- Rotate compressor every 2 minutes, or sooner if fatigued.
- If no advanced airway, 30:2 compression-ventilation ratio.
- Quantitative waveform capnography
  - If PETCO<sub>2</sub> <10 mm Hg, attempt to improve CPR quality
- Intra-arterial pressure.
  - If relaxation phase (diastolic) pressure <20 mm Hg, attempt to improve CPR quality.

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## Return of Spontaneous Circulation (ROSC)

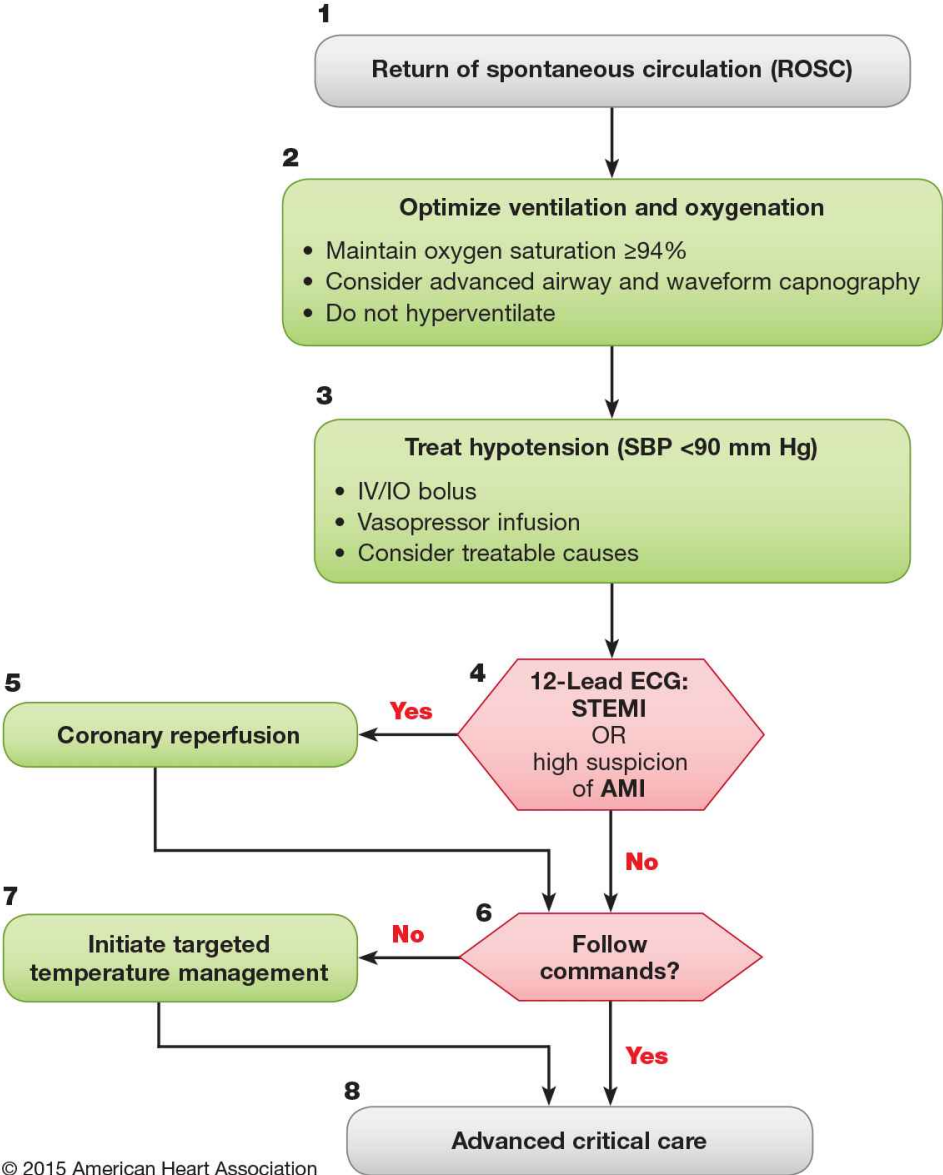
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- Hypoxia
- Hydrogen ion (acidosis)
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- Tamponade, cardiac
- Toxins
- Thrombosis, pulmonary
- Thrombosis, coronary



# Adult Immediate Post-Cardiac Arrest Care Algorithm—2015 Update



## Doses/Details

### Ventilation/oxygenation:

Avoid excessive ventilation. Start at 10 breaths/min and titrate to target PETCO<sub>2</sub> of 35-40 mm Hg.

When feasible, titrate FIO<sub>2</sub> to minimum necessary to achieve SpO<sub>2</sub>  $\geq 94\%$ .

### IV bolus:

Approximately 1-2 L normal saline or lactated Ringer's

### Epinephrine IV infusion:

0.1-0.5 mcg/kg per minute (in 70-kg adult: 7-35 mcg per minute)

### Dopamine IV infusion:

5-10 mcg/kg per minute

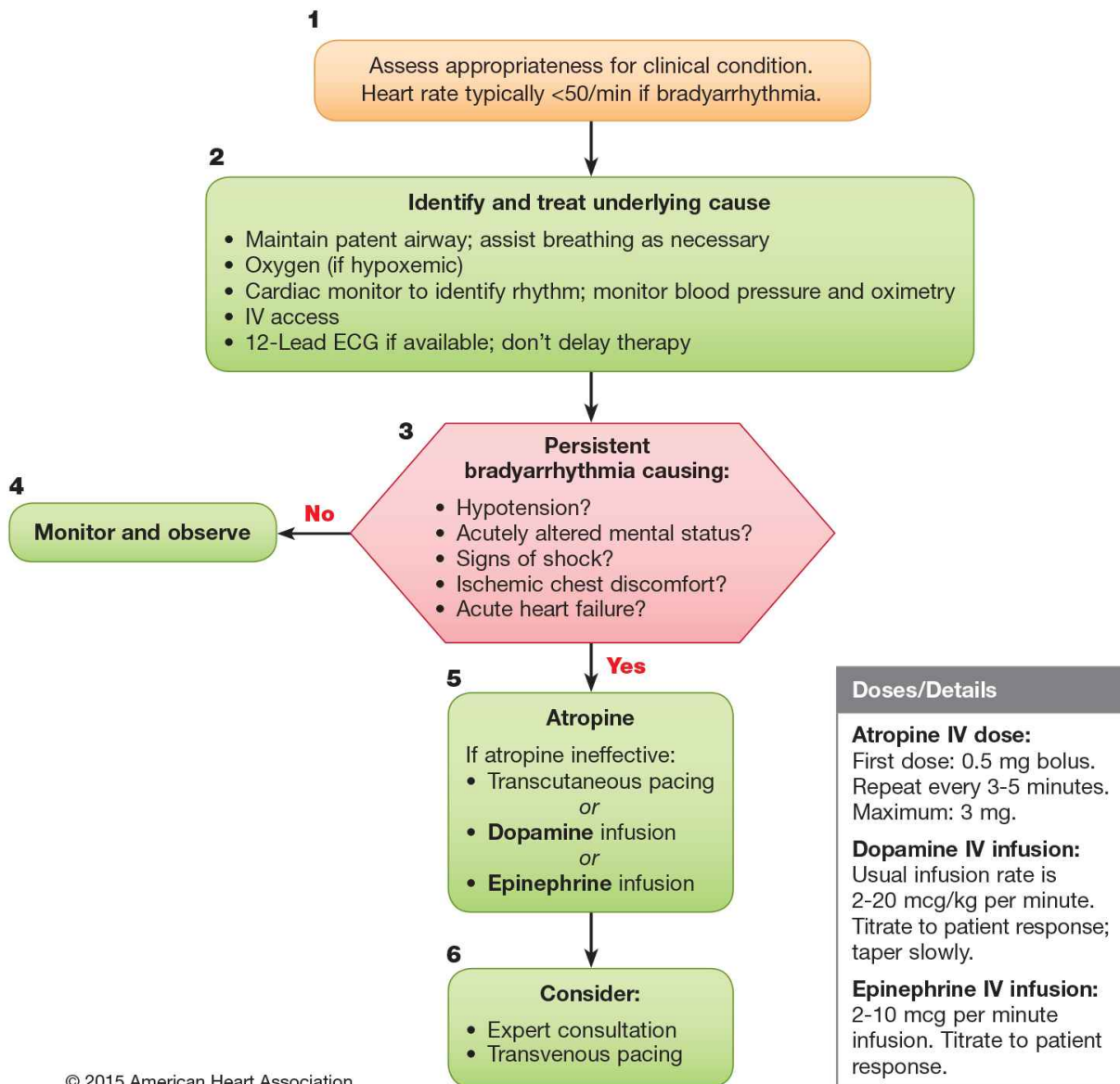
### Norepinephrine IV infusion:

0.1-0.5 mcg/kg per minute (in 70-kg adult: 7-35 mcg per minute)

## Reversible Causes

- Hypovolemia
- Hypoxia
- Hydrogen ion (acidosis)
- Hypo-/hyperkalemia
- Hypothermia
- Tension pneumothorax
- Tamponade, cardiac
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- Thrombosis, coronary

# Adult Bradycardia With a Pulse Algorithm



# Adult Tachycardia With a Pulse Algorithm

1

Assess appropriateness for clinical condition.  
Heart rate typically  $\geq 150/\text{min}$  if tachyarrhythmia.

2

## Identify and treat underlying cause

- Maintain patent airway; assist breathing as necessary
- Oxygen (if hypoxemic)
- Cardiac monitor to identify rhythm; monitor blood pressure and oximetry

3

## Persistent tachyarrhythmia causing:

- Hypotension?
- Acutely altered mental status?
- Signs of shock?
- Ischemic chest discomfort?
- Acute heart failure?

Yes

4

## Synchronized cardioversion

- Consider sedation
- If regular narrow complex, consider adenosine

No

5

## Wide QRS? $\geq 0.12$ second

Yes

6

- IV access and 12-lead ECG if available
- Consider adenosine only if regular and monomorphic
- Consider antiarrhythmic infusion
- Consider expert consultation

No

7

- IV access and 12-lead ECG if available
- Vagal maneuvers
- Adenosine (if regular)
- $\beta$ -Blocker or calcium channel blocker
- Consider expert consultation

## Doses/Details

### Synchronized cardioversion:

Initial recommended doses:

- Narrow regular: 50-100 J
- Narrow irregular: 120-200 J biphasic or 200 J monophasic
- Wide regular: 100 J
- Wide irregular: defibrillation dose (not synchronized)

### Adenosine IV dose:

First dose: 6 mg rapid IV push; follow with NS flush.

Second dose: 12 mg if required.

### Antiarrhythmic Infusions for Stable Wide-QRS Tachycardia

#### Procainamide IV dose:

20-50 mg/min until arrhythmia suppressed, hypotension ensues, QRS duration increases  $>50\%$ , or maximum dose 17 mg/kg given. Maintenance infusion: 1-4 mg/min. Avoid if prolonged QT or CHF.

#### Amiodarone IV dose:

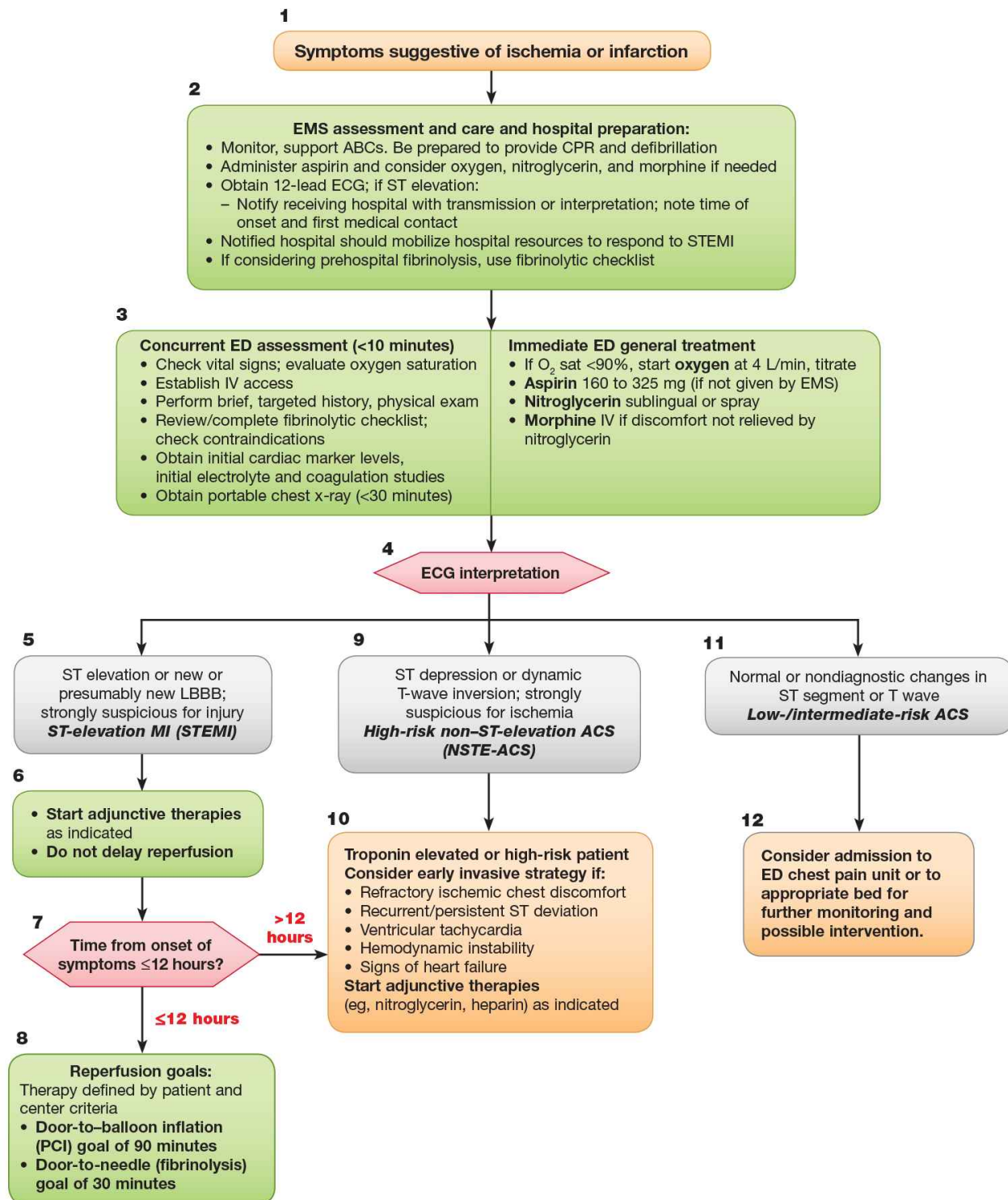
First dose: 150 mg over 10 minutes. Repeat as needed if VT recurs. Follow by maintenance infusion of 1 mg/min for first 6 hours.

#### Sotalol IV dose:

100 mg (1.5 mg/kg) over 5 minutes. Avoid if prolonged QT.



# Acute Coronary Syndromes Algorithm—2015 Update



# Prehospital Fibrinolytic Checklist\*

**Step  
1**

Has patient experienced chest discomfort for greater than 15 minutes and less than 12 hours?

YES

NO

Does ECG show STEMI or new or presumably new LBBB?

YES

NO



**Step  
2**

Are there contraindications to fibrinolysis?

If **ANY** of the following is CHECKED **YES**, fibrinolysis MAY be contraindicated.

Systolic BP >180 to 200 mm Hg or diastolic BP >100 to 110 mm Hg	<input type="radio"/> <b>YES</b>	<input type="radio"/> NO
Right vs left arm systolic BP difference >15 mm Hg	<input type="radio"/> <b>YES</b>	<input type="radio"/> NO
History of structural central nervous system disease	<input type="radio"/> <b>YES</b>	<input type="radio"/> NO
Significant closed head/facial trauma within the previous 3 months	<input type="radio"/> <b>YES</b>	<input type="radio"/> NO
Stroke >3 hours or <3 months	<input type="radio"/> <b>YES</b>	<input type="radio"/> NO
Recent (within 2-4 weeks) major trauma, surgery (including laser eye surgery), GI/GU bleed	<input type="radio"/> <b>YES</b>	<input type="radio"/> NO
Any history of intracranial hemorrhage	<input type="radio"/> <b>YES</b>	<input type="radio"/> NO
Bleeding, clotting problem, or blood thinners	<input type="radio"/> <b>YES</b>	<input type="radio"/> NO
Pregnant female	<input type="radio"/> <b>YES</b>	<input type="radio"/> NO
Serious systemic disease (eg, advanced cancer, severe liver or kidney disease)	<input type="radio"/> <b>YES</b>	<input type="radio"/> NO

**Step  
3**

Is patient at high risk?

If **ANY** of the following is CHECKED **YES**, consider transfer to PCI facility.

Heart rate $\geq 100$ /min AND systolic BP <100 mm Hg	<input type="radio"/> <b>YES</b>	<input type="radio"/> NO
Pulmonary edema (rales)	<input type="radio"/> <b>YES</b>	<input type="radio"/> NO
Signs of shock (cool, clammy)	<input type="radio"/> <b>YES</b>	<input type="radio"/> NO
Contraindications to fibrinolytic therapy	<input type="radio"/> <b>YES<sup>†</sup></b>	<input type="radio"/> NO
Required CPR	<input type="radio"/> <b>YES</b>	<input type="radio"/> NO

\*Contraindications for fibrinolytic use in STEMI are viewed as advisory for clinical decision making and may not be all-inclusive or definitive. These contraindications are consistent with the 2004 ACC/AHA Guidelines for the Management of Patients With ST-Elevation Myocardial Infarction.

<sup>†</sup>Consider transport to primary PCI facility as destination hospital.

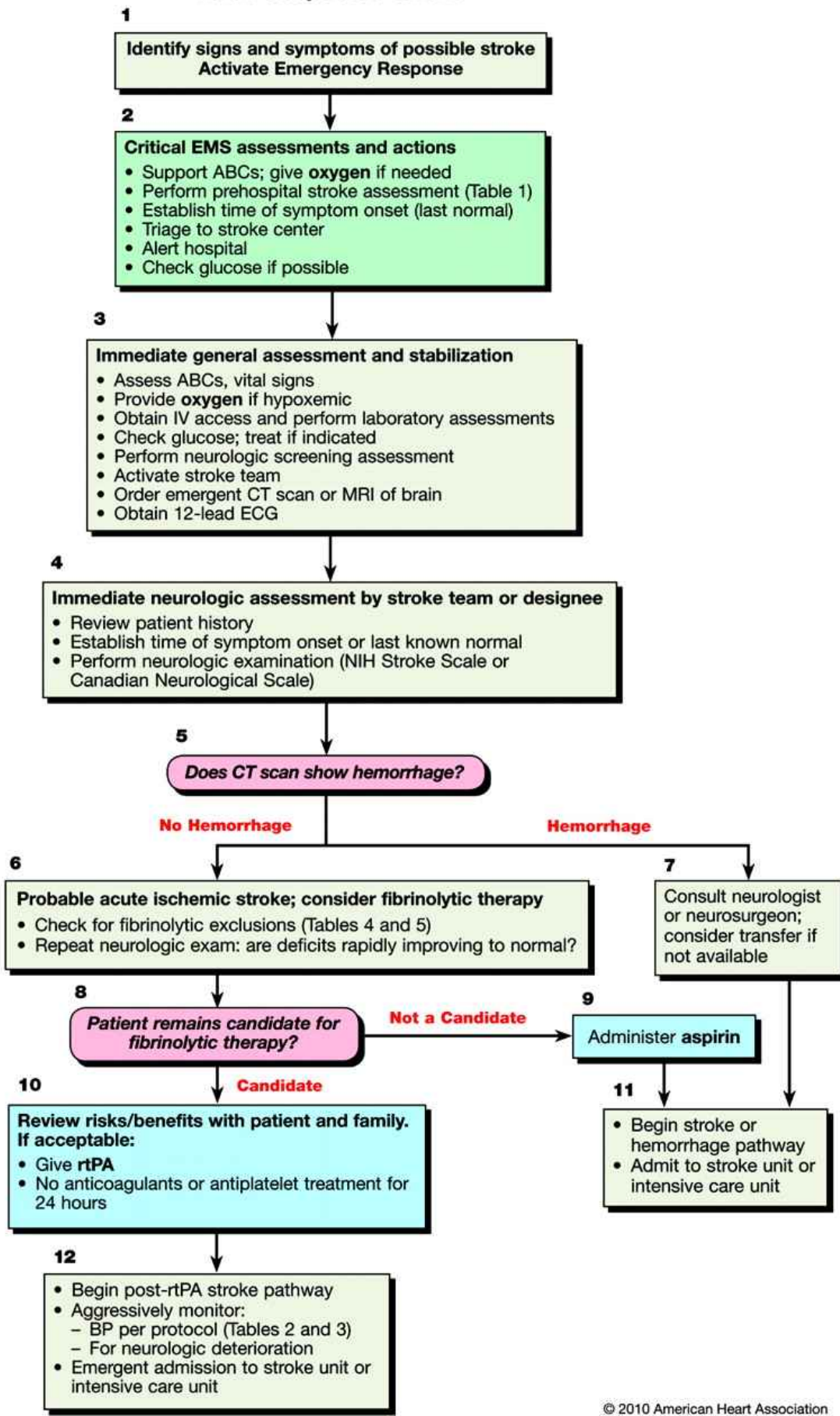
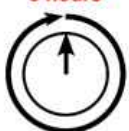
Prehospital fibrinolytic checklist. Adapted from Antman EM, et al. ACC/AHA guidelines for the management of patients with ST-elevation myocardial infarction: a report of the American College of Cardiology/American Heart Association Task Force on Practice Guidelines (Committee to Revise the 1999 Guidelines for the Management of Patients with Acute Myocardial Infarction). *Circulation*. 2004;110:e82-e292, with permission from Lippincott Williams & Wilkins. Copyright 2004, American Heart Association.

# Adult Suspected Stroke

## NINDS TIME GOALS



Stroke  
Admission  
3 hours



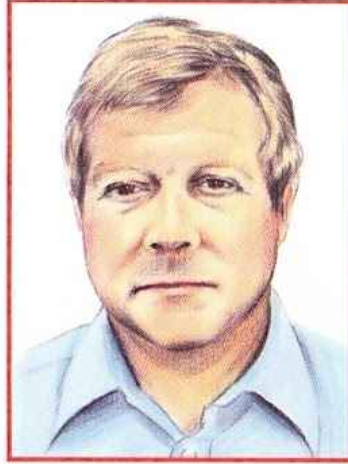


# Stroke Assessment

## The Cincinnati Prehospital Stroke Scale

**Facial Droop** (have patient show teeth or smile):

- Normal—both sides of face move equally
- Abnormal—one side of face does not move as well as the other side



*Left: Normal. Right: Stroke patient with facial droop (right side of face).*

**Arm Drift** (patient closes eyes and extends both arms straight out, with palms up, for 10 seconds):

- Normal—both arms move the same or both arms do not move at all (other findings, such as pronator drift, may be helpful)
- Abnormal—one arm does not move or one arm drifts down compared with the other



*Left: Normal. Right: One-sided motor weakness (right arm).*

**Abnormal Speech** (have the patient say “you can’t teach an old dog new tricks”):

- Normal—patient uses correct words with no slurring
- Abnormal—patient slurs words, uses the wrong words, or is unable to speak

**Interpretation:** If any 1 of these 3 signs is abnormal, the probability of a stroke is 72%.



# Use of IV rtPA for Acute Ischemic Stroke: Inclusion and Exclusion Characteristics

## Patients Who Could Be Treated With rtPA Within 3 Hours From Symptom Onset\*

### Inclusion Criteria

- Diagnosis of ischemic stroke causing measurable neurologic deficit
- Onset of symptoms <3 hours before beginning treatment
- Age  $\geq 18$  years

### Exclusion Criteria

- Head trauma or prior stroke in previous 3 months
- Symptoms suggest subarachnoid hemorrhage
- Arterial puncture at noncompressible site in previous 7 days
- History of previous intracranial hemorrhage
- Elevated blood pressure (systolic  $>185$  mm Hg or diastolic  $>110$  mm Hg)
- Evidence of active bleeding on examination
- Acute bleeding diathesis, including but not limited to
  - Platelet count  $<100\,000/\text{mm}^3$
  - Heparin received within 48 hours, resulting in aPTT  $>$ upper limit of normal
  - Current use of anticoagulant with INR  $>1.7$  or PT  $>15$  seconds
- Blood glucose concentration  $<50$  mg/dL (2.7 mmol/L)
- CT demonstrates multilobar infarction (hypodensity  $>1/3$  cerebral hemisphere)

### Relative Exclusion Criteria

Recent experience suggests that under some circumstances—with careful consideration and weighing of risk to benefit—patients may receive fibrinolytic therapy despite 1 or more relative contraindications. Consider risk to benefit of rtPA administration carefully if any one of these relative contraindications is present:

- Only minor or rapidly improving stroke symptoms (clearing spontaneously)
- Seizure at onset with postictal residual neurologic impairments
- Major surgery or serious trauma within previous 14 days
- Recent gastrointestinal or urinary tract hemorrhage (within previous 21 days)
- Recent acute myocardial infarction (within previous 3 months)

## Patients Who Could Be Treated With rtPA From 3 to 4.5 Hours From Symptom Onset†

### Inclusion Criteria

- Diagnosis of ischemic stroke causing measurable neurologic deficit
- Onset of symptoms 3 to 4.5 hours before beginning treatment

### Exclusion Criteria

- Age  $>80$  years
- Severe stroke (NIHSS  $>25$ )
- Taking an oral anticoagulant regardless of INR
- History of both diabetes and prior ischemic stroke

### Notes

- The checklist includes some US FDA–approved indications and contraindications for administration of rtPA for acute ischemic stroke. Recent AHA/ASA guideline revisions may differ slightly from FDA criteria. A physician with expertise in acute stroke care may modify this list.
- Onset time is either witnessed or last known normal.
- In patients without recent use of oral anticoagulants or heparin, treatment with rtPA can be initiated before availability of coagulation study results but should be discontinued if INR is  $>1.7$  or PT is elevated by local laboratory standards.
- In patients without history of thrombocytopenia, treatment with rtPA can be initiated before availability of platelet count but should be discontinued if platelet count is  $<100\,000/\text{mm}^3$ .

Abbreviations: aPTT, activated partial thromboplastin time; FDA, Food and Drug Administration; INR, international normalized ratio; NIHSS, National Institutes of Health Stroke Scale; PT, prothrombin time; rtPA, recombinant tissue plasminogen activator.



# Stroke: Treatment of Hypertension

## Potential Approaches to Arterial Hypertension in Acute Ischemic Stroke Patients Who Are Potential Candidates for Acute Reperfusion Therapy\*

Patient otherwise eligible for acute reperfusion therapy except that blood pressure is  $>185/110$  mm Hg:

- Labetalol 10-20 mg IV over 1-2 minutes, may repeat  $\times 1$ , or
- Nicardipine IV 5 mg per hour, titrate up by 2.5 mg per hour every 5-15 minutes, maximum 15 mg per hour; when desired blood pressure is reached, lower to 3 mg per hour, or
- Other agents (hydralazine, enalaprilat, etc) may be considered when appropriate

If blood pressure is not maintained at or below 185/110 mm Hg, do not administer rtPA.

Management of blood pressure during and after rtPA or other acute reperfusion therapy:

Monitor blood pressure every 15 minutes for 2 hours from the start of rtPA therapy, then every 30 minutes for 6 hours, and then every hour for 16 hours.

If systolic blood pressure 180-230 mm Hg or diastolic blood pressure 105-120 mm Hg:

- Labetalol 10 mg IV followed by continuous IV infusion 2-8 mg per minute, or
- Nicardipine IV 5 mg per hour, titrate up to desired effect by 2.5 mg per hour every 5-15 minutes, maximum 15 mg per hour

If blood pressure not controlled or diastolic blood pressure  $>140$  mm Hg, consider sodium nitroprusside.

## Approach to Arterial Hypertension in Acute Ischemic Stroke Patients Who Are Not Potential Candidates for Acute Reperfusion Therapy\*

Consider lowering blood pressure in patients with acute ischemic stroke if systolic blood pressure  $>220$  mm Hg or diastolic blood pressure  $>120$  mm Hg.

Consider blood pressure reduction as indicated for other concomitant organ system injury:

- Acute myocardial infarction
- Congestive heart failure
- Acute aortic dissection

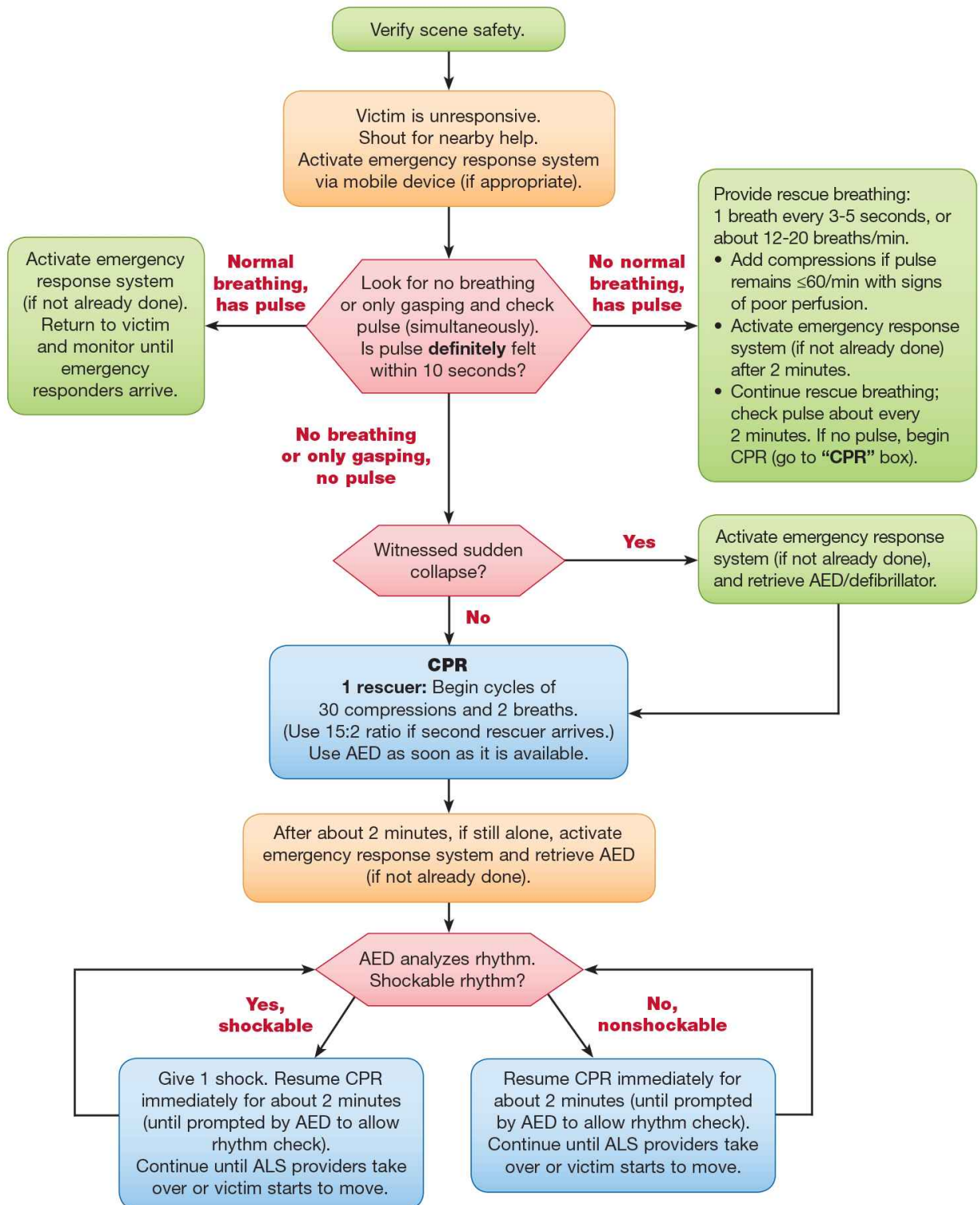
A reasonable target is to lower blood pressure by 15% to 25% within the first day.

\*Adams HP Jr, del Zoppo G, Alberts MJ, Bhatt DL, Brass L, Furlan A, Grubb RL, Higashida RT, Jauch EC, Kidwell C, Lyden PD, Morgenstern LB, Qureshi AI, Rosenwasser RH, Scott PA, Wijdicks EFM. Guidelines for the early management of adults with ischemic stroke: a guideline from the American Heart Association/American Stroke Association Stroke Council, Clinical Cardiology Council, Cardiovascular Radiology and Intervention Council, and the Atherosclerotic Peripheral Vascular Disease and Quality of Care Outcomes in Research Interdisciplinary Working Groups. *Stroke*. 2007;38:1655-1711.

†del Zoppo GJ, Saver JL, Jauch EC, Adams HP Jr; on behalf of the American Heart Association Stroke Council. Expansion of the time window for treatment of acute ischemic stroke with intravenous tissue plasminogen activator: a science advisory from the American Heart Association/American Stroke Association. *Stroke*. 2009;40:2945-2948.

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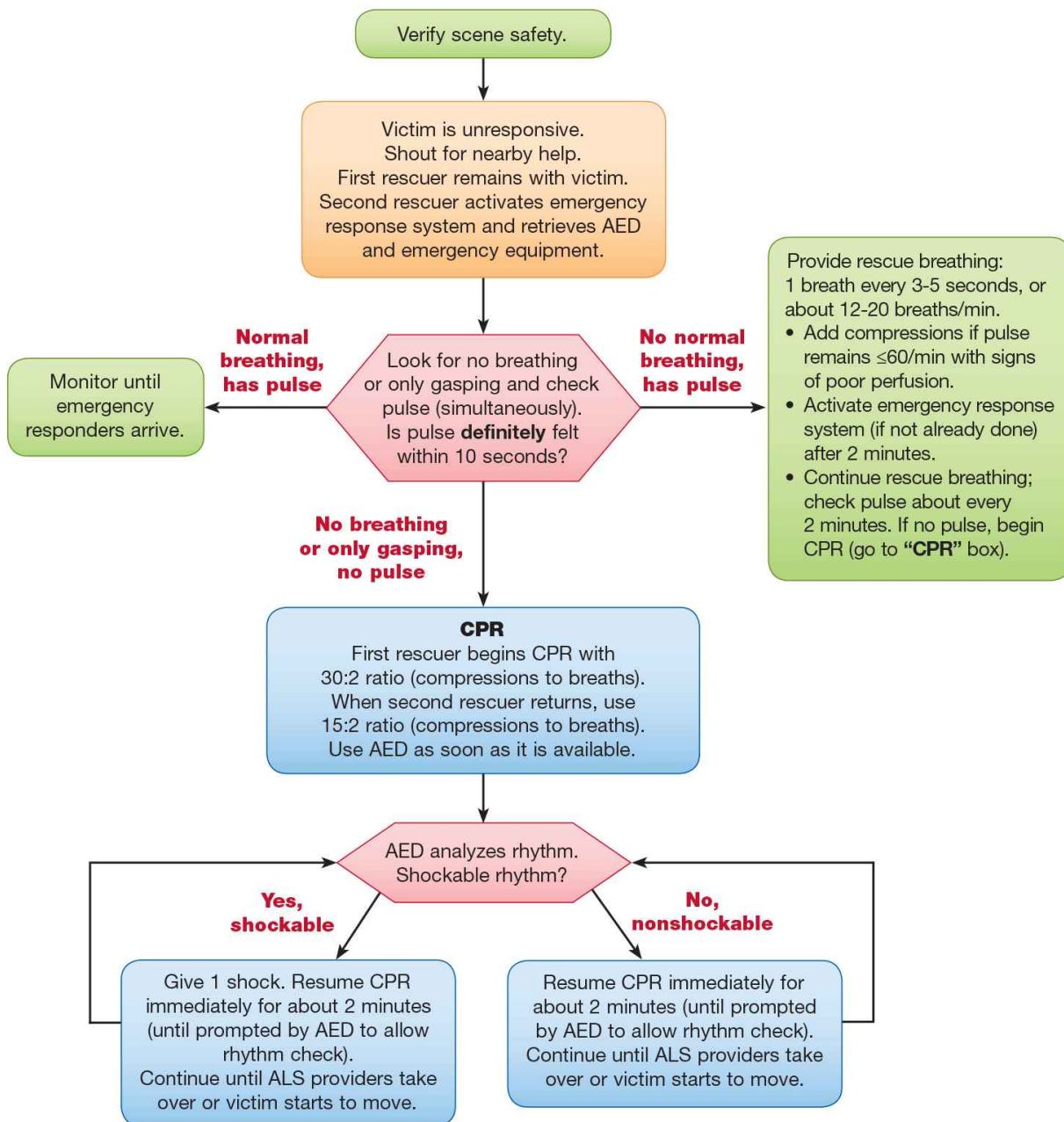
## Pediatric Cardiac Arrest Algorithm for the Single Rescuer—2015 Update



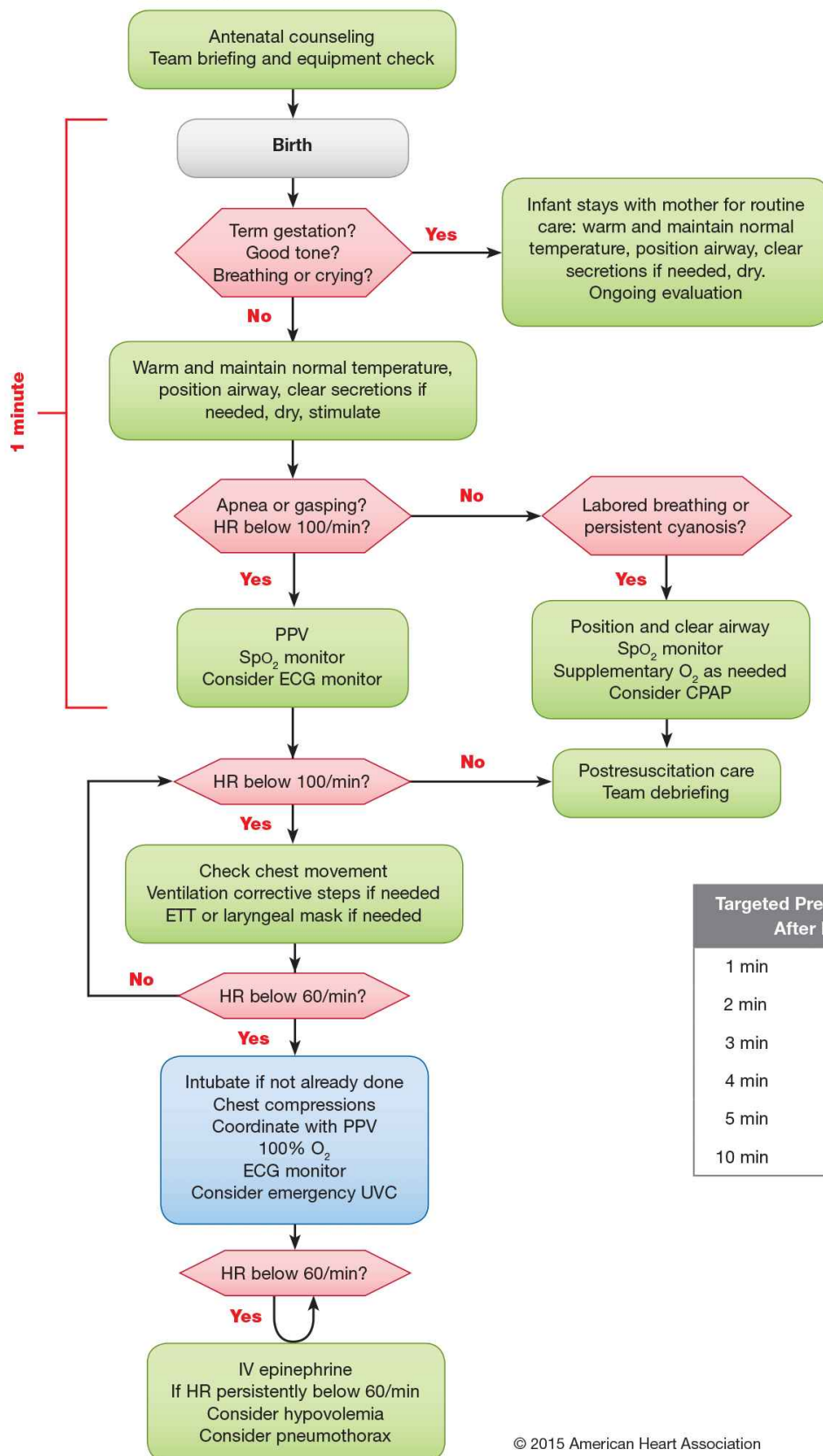


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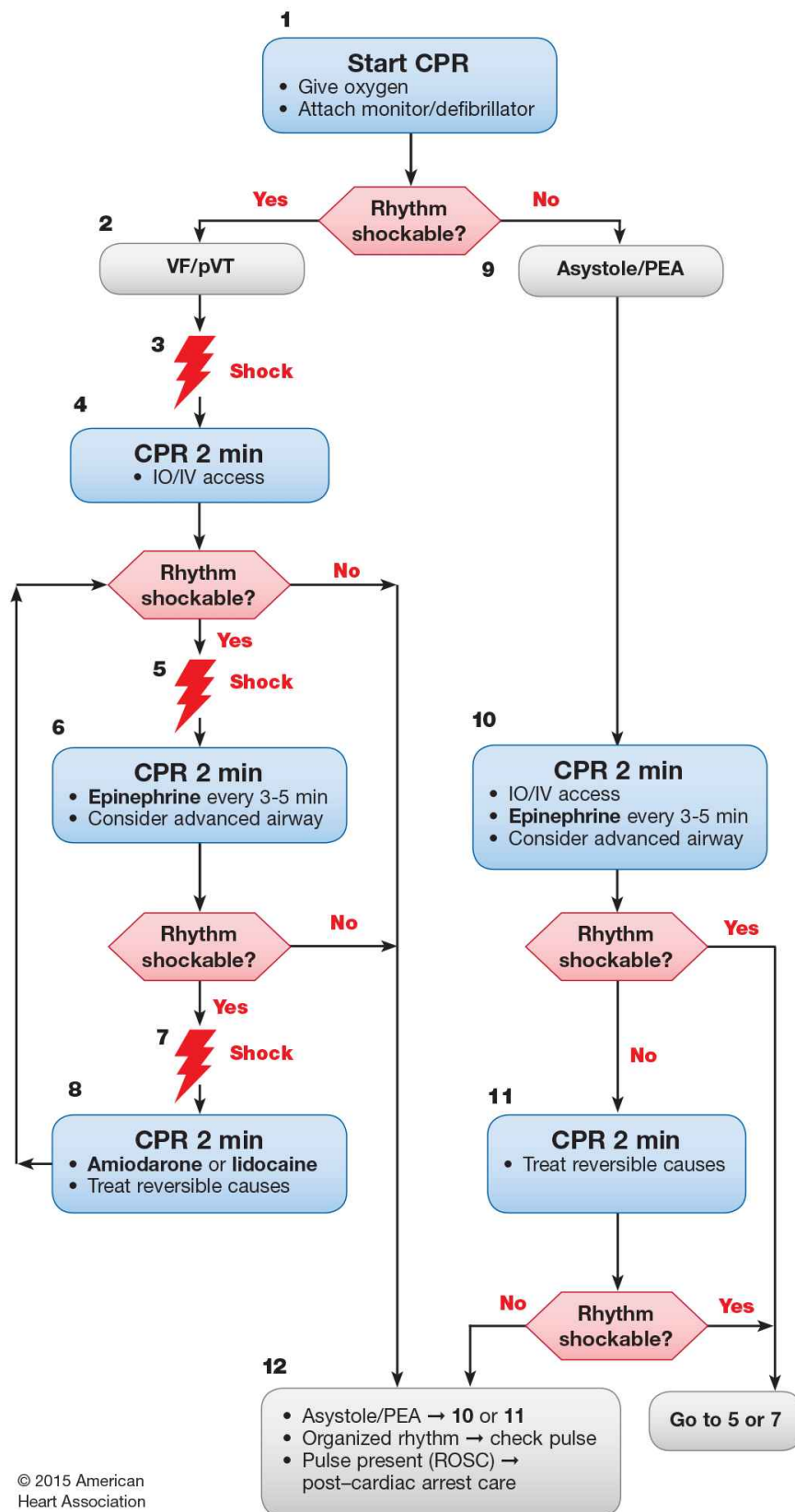
## Pediatric Cardiac Arrest Algorithm for 2 or More Rescuers—2015 Update



# Neonatal Resuscitation Algorithm—2015 Update



# Pediatric Cardiac Arrest Algorithm—2015 Update



## CPR Quality

- Push hard ( $\geq \frac{1}{3}$  of anteroposterior diameter of chest) and fast (100-120/min) and allow complete chest recoil.
- Minimize interruptions in compressions.
- Avoid excessive ventilation.
- Rotate compressor every 2 minutes, or sooner if fatigued.
- If no advanced airway, 15:2 compression-ventilation ratio.

## Shock Energy for Defibrillation

First shock 2 J/kg, second shock 4 J/kg, subsequent shocks  $\geq 4$  J/kg, maximum 10 J/kg or adult dose

## Drug Therapy

- **Epinephrine IO/IV dose:** 0.01 mg/kg (0.1 mL/kg of 1:10 000 concentration). Repeat every 3-5 minutes. If no IO/IV access, may give endotracheal dose: 0.1 mg/kg (0.1 mL/kg of 1:1000 concentration).
- **Amiodarone IO/IV dose:** 5 mg/kg bolus during cardiac arrest. May repeat up to 2 times for refractory VF/pulseless VT.
- **Lidocaine IO/IV dose:** Initial: 1 mg/kg loading dose. Maintenance: 20-50 mcg/kg per minute infusion (repeat bolus dose if infusion initiated >15 minutes after initial bolus therapy).

## Advanced Airway

- Endotracheal intubation or supraglottic advanced airway
- Waveform capnography or capnometry to confirm and monitor ET tube placement
- Once advanced airway in place, give 1 breath every 6 seconds (10 breaths/min) with continuous chest compressions

## Return of Spontaneous Circulation (ROSC)

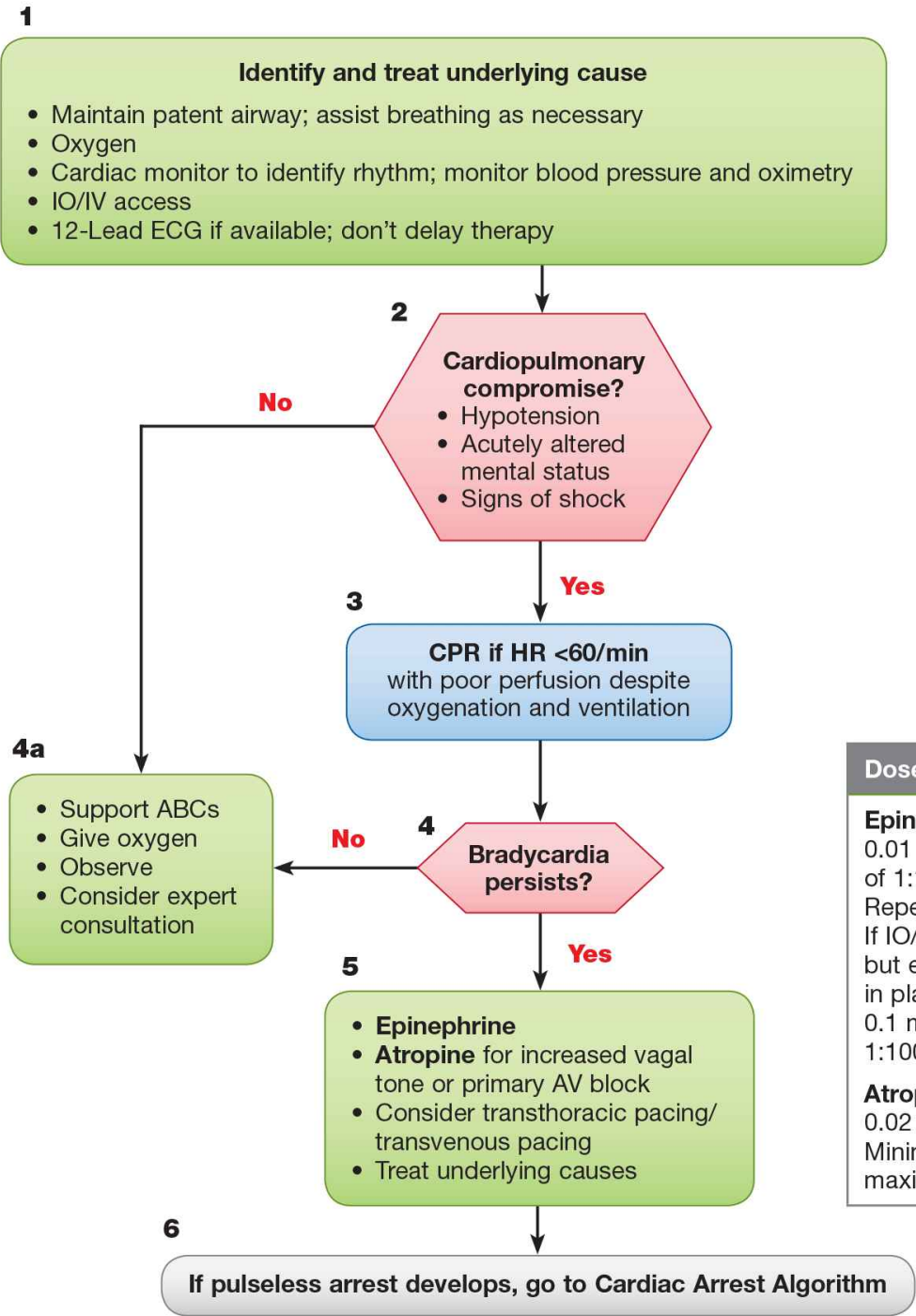
- Pulse and blood pressure
- Spontaneous arterial pressure waves with intra-arterial monitoring

## Reversible Causes

- Hypovolemia
- Hypoxia
- Hydrogen ion (acidosis)
- Hypoglycemia
- Hypo-/hyperkalemia
- Hypothermia
- Tension pneumothorax
- Tamponade, cardiac
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# Pediatric Bradycardia With a Pulse and Poor Perfusion Algorithm



## Doses/Details

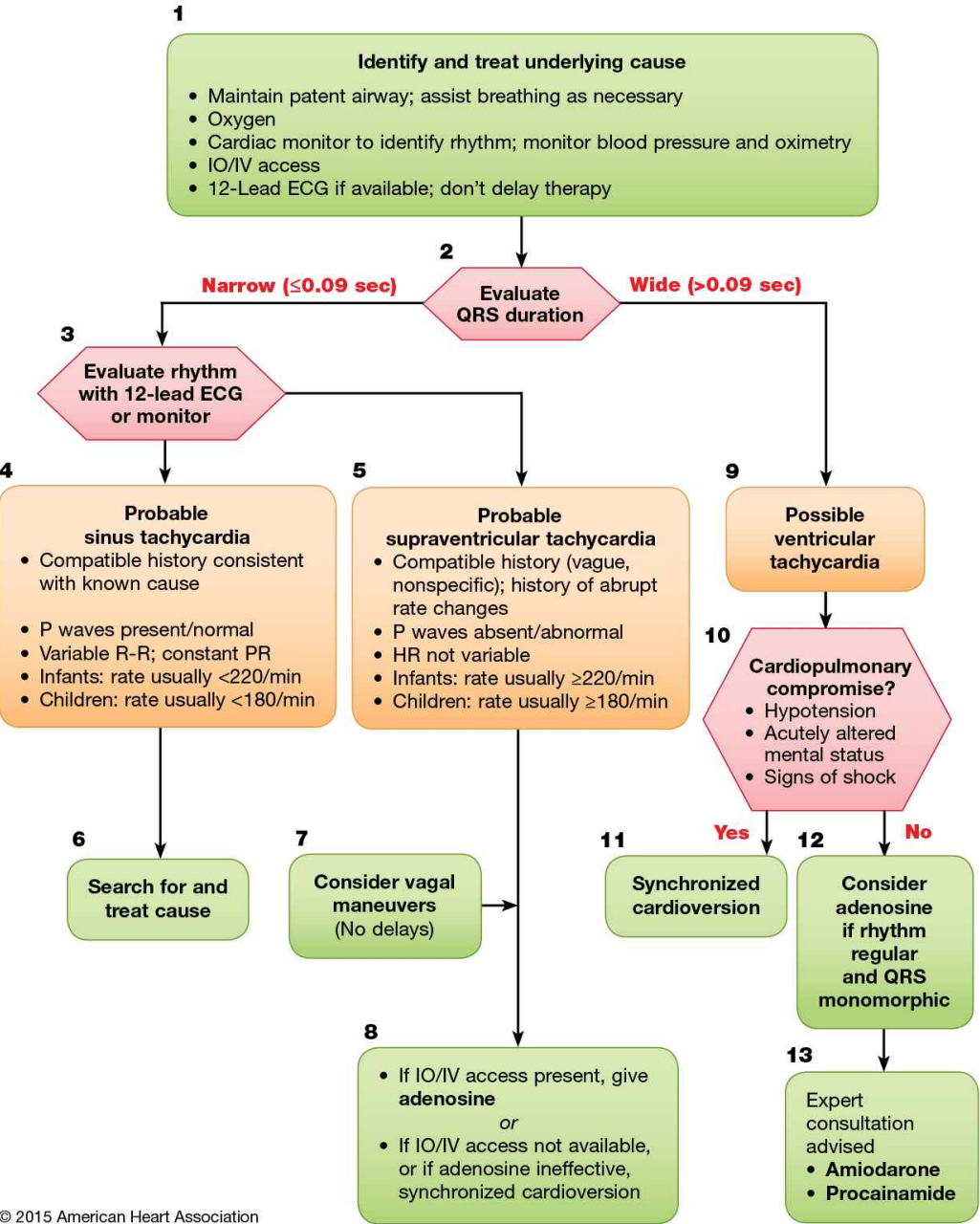
### Epinephrine IO/IV dose:

0.01 mg/kg (0.1 mL/kg of 1:10 000 concentration). Repeat every 3-5 minutes. If IO/IV access not available but endotracheal (ET) tube in place, may give ET dose: 0.1 mg/kg (0.1 mL/kg of 1:1000).

### Atropine IO/IV dose:

0.02 mg/kg. May repeat once. Minimum dose 0.1 mg and maximum single dose 0.5 mg.

Pediatric Tachycardia With a Pulse and Poor Perfusion Algorithm



Doses/Details

Synchronized Cardioversion

Begin with 0.5-1 J/kg; if not effective, increase to 2 J/kg. Sedate if needed, but don't delay cardioversion.

Drug Therapy

**Adenosine IO/IV dose:**

First dose: 0.1 mg/kg rapid bolus (maximum: 6 mg).  
Second dose: 0.2 mg/kg rapid bolus (maximum second dose: 12 mg).

**Amiodarone IO/IV dose:**

5 mg/kg over 20-60 minutes  
or

**Procainamide IO/IV dose:**

15 mg/kg over 30-60 minutes

Do not routinely administer amiodarone and procainamide together.